

CLAIMS:

20/20/2014

- 1) A method of cutting a substrate comprising the steps of:
 - a) providing a laterally disposed substrate;
 - b) focussing a first laser beam onto a first laser focus point on the substrate;
 - c) focussing a second laser beam onto a second laser focus point on the substrate, the second laser focus point being relatively vertically displaced from the said first laser focus point; and
 - d) effecting relative lateral movement between the said substrate and the said first and second laser focus points respectively so that the said first laser focus point follows a cutting path on the said substrate, the said second laser focus point also following the said cutting path but being relatively vertically displaced from the said first laser focus point, a first layer of the said substrate being removed along the cutting path by the first laser beam and a second layer of the said substrate being removed along the cutting path by the second laser beam.
- 2) A method according to claim 1 wherein both first and second laser beams irradiate the same lateral face of the substrate.
- 3) A method according to claim 1 wherein the first and second laser beams irradiate first and second lateral faces of the substrate respectively.

4) A method according to any previous claim wherein the substrate
is composed of plural layers.

5) A method according to claim 4 wherein further laser beams are
provided, the number of laser beams corresponding to the
number of separate layers to be removed.

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6) A method according to claim 4 or claim 5 wherein each said
layer comprises different materials or combinations of
materials.

7) A method according to claim 6 wherein the properties of each
10 said respective laser beam are selected so as to be suitable
for the removal of the particular layer or layers to be
removed thereby.

8) A method according to any previous claim including the
additional step of optically monitoring the cutting region,
15 the cutting process being controlled in response to the said
optical monitoring.

9) Apparatus for cutting a substrate comprising:

a) means for supporting a laterally disposed substrate;

b) means for generating a first laser beam which in use is
20 focussed onto a first laser focus point on the substrate;

c) means for generating a second laser beam which in use is
focussed onto a second laser focus point on the substrate,
the second laser focus point being relatively vertically
displaced from the said first laser focus point; and

25 d) means for effecting relative lateral movement between the
said substrate and the said first and second laser focus

points respectively so that the said first laser focus point follows a cutting path on the said substrate, the said second laser focus point also following the said cutting path but being relatively vertically displaced from the said first laser focus point, a first layer of the said substrate being removed along the cutting path by the first laser beam and a second layer of the said substrate being removed along the cutting path by the second laser beam.

10 10) Apparatus according to claim 9 wherein the first and second laser beams are arranged so as to irradiate the same lateral face of the substrate.

11) Apparatus according to claim 9 wherein the first and second laser beams are arranged so as to irradiate first and second lateral faces of the substrate respectively.

15 12) Apparatus according to any previous claim wherein the substrate is composed of plural layers.

13) Apparatus according to claim 12 wherein further laser beams are provided, the number of laser beams corresponding to the number of separate layers to be removed.

20 14) Apparatus according to any of claims 9 - 13 wherein at least two of the said laser beams provide laser light having different parameters.

15) Apparatus according to claim 14 wherein the said parameters include one or more of wavelength, pulse duration and intensity.

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16) Apparatus according to any of claims 12 - 15 wherein each said layer comprises different materials or combinations of materials.

17) Apparatus according to claim 16 wherein the properties of each said respective laser beam are selected so as to be suitable for the removal of the particular layer or layers to be removed thereby.

5 18) Apparatus according to any of claims 9 - 17 wherein beam splitter means are provided so that at least two laser beams are derived from the same laser source.

10 19) Apparatus according to any of claims 9 - 18 wherein optical monitoring means are provided for optically monitoring the cutting region, means being provided to control the cutting process in response to the said optical monitoring.

15 20) A method substantially as herein described and illustrated in the accompanying drawings.

21) Apparatus substantially as herein described and illustrated in the accompanying drawings.